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Committee on Energy and Commerce of the United States House of Representatives**

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Mr. Chairman, Ranking Member Barton, Members of the Subcommittee, I am grateful for the opportunity to appear before you today. In my testimony, I would like to highlight two larger themes that are often overlooked in the network neutrality debate.

First, the Internet is undergoing a fundamental transformation. During the Internet's early years, when the National Science Foundation initially supported civilian backbone services, the Internet employed a fairly uniform technology to connect a fairly uniform group of end users who were running a fairly uniform set of applications. Specifically, the Internet relied almost exclusively on technologies developed by telephone companies to enable university-based researchers to share e-mail and text files.

All of that has begun to change. The Internet has become a mass market phenomenon that now reaches over 70% of all American adults and a growing number of people worldwide. As a result, Internet traffic grown at a breathtaking rate. From 1990 to 2002, the total volume of Internet traffic doubled each year except for 1995 and 1996, when the volume experienced an eight- or nine-fold increase each year. Starting in 2003, Internet traffic has grown roughly 50% to 60% each year, but even that rate still poses more than its share of challenges.

Internet traffic is growing not only in terms of size, but also in sophistication. During the Internet's initial phase, the primary applications were e-mail and web browsing. For these applications, delays of a fraction of a second were virtually unnoticeable. The current Internet is increasingly dominated by more sophisticated applications such as streaming media, online gaming, telemedicine, and virtual worlds, which are often much more bandwidth intensive and much less tolerant of delay. The most important development is the deployment of IP video, which some experts estimate will cause that traffic to grow once again at a rate of 90% to 100% each year.

Network providers are pursuing a number of strategies to meet this rapidly increasing demand. Unlike the initial transition to broadband, which only required reconditioning existing cable and telephone technologies, the new strategies require significantly greater capital investments. Verizon is investing \$23 billion to make its FiOS system available to roughly half of its subscriber base. This system can support upload and download speeds of up to 20 MB. AT&T is pursuing a different strategy, committing \$6.5 billion to deploy its new U-verse system based on a telephone-based technology known as VDSL to 60% of its service area. These developments have forced cable companies to respond, with Comcast investing additional billions to upgrade portions of its network to DOCSIS 3.0. Thus, technologies now vary widely across providers and even across any particular provider's service area.

But perhaps the most important and most often overlooked development is the emergence of wireless as a major broadband competitor. The most recent FCC data reveal that wireless has skyrocketed from having no subscribers as of the beginning on of 2005 to controlling 35 million subscribers and 35% of the market for high-speed lines as of June 2007. Published reports indicate that wireless broadband has continued to grow rapidly.

The result is that the broadband industry is becoming increasingly competitive. Even network neutrality proponents concede that an increase in competition undercuts the justification for regulatory intervention.

The increasing heterogeneity of Internet usage has further increased the uncertainty of the business environment. For the past several years, the Internet appeared to have been shifting from a client-server architecture, in which files are hosted in central locations and downloaded to end users, toward a peer-to-peer architecture, in which files are stored throughout the network. For the past several years, peer-to-peer traffic exceeded client-server traffic. Last year, thanks to new download-based applications such as YouTube, client-server traffic once again regained the upper hand.

These developments underscore the challenges posed by the uncertainty of the technological environment. A network designed around a client-server allocates bandwidth asymmetrically, with more capacity committed to downloads than to uploads. A network designed around a peer-to-peer architecture allocates download and upload bandwidth more evenly.

Network providers must thus make decisions that involve difficult tradeoffs based on their best guess of what the future will bring. These considerations underscore the problems associated with any one-size-fits-all solution to the Internet. The network now consists of very different transmission technologies, each of which is susceptible to different problems and different solutions. In addition, the number of potential solutions is vast, including building additional bandwidth, storing content locally, and network management.

The difficulty of anticipating which of these solutions will prove best in each context is underscored dramatically by the AOL-Time Warner merger. When it was announced in 2001,

many regarded the “walled garden” approach in which AOL gave preferential treatment to its own propriety content as a profound threat to the Internet. These threats never materialized, demonstrated most eloquently by Time Warner’s recent announcement that it was selling off AOL at a loss of \$200 billion.

My second point is to draw on the lessons of past efforts to implement access mandates similar to network neutrality. Past regulatory efforts have found that such interconnection and nondiscrimination mandates only work when the interface is relatively and the product being regulated is relatively simple. As the Supreme Court recognized in its *Trinko* decision, the situation is quite different when the interface is complex. When that is the case, disputes over access are likely to be “highly technical” and “extremely numerous, given the incessant, complex, and constantly changing interaction” between providers.”¹ Thus, in order to protect against “death by a thousand cuts,” any regulator would have to undertake comprehensive oversight of essentially all facets of the business relationship between the parties. The challenge of doing so would be particularly demanding in industries like broadband, which are undergoing rapid technological change.² This has led many commentators to conclude that any attempts to mandate access to such complex technologies are likely to prove futile.³ Indeed, past efforts to impose similar access regimes, such the controversy over protocol conversion and vertical switching services under the Computer Inquiries, leased access to cable television networks, and unbundled access to network elements under the 1996 Act, have become bogged down in incessant controversies and litigation.

¹ Verizon Commc’ns Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. 398, 414 (2004).

² Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1, 39-45 (2005), available at <http://ssrn.com/abstract=742404>; Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847, 1896-97 (2006), available at <http://ssrn.com/abstract=825669>.

³ See, e.g., Paul L. Joskow & Roger G. Noll, *The Bell Doctrine: Applications in Telecommunications, Electricity, and Other Network Industries*, 51 STAN. L. REV. 1249 (1999); Gerald R. Faulhaber, *Policy-Induced Competition: The Telecommunications Experiments*, 15 INFO. ECON. & POL’Y 73 (2003).

These problems demonstrate the potential dangers of regulatory intervention and underscore the importance of making sure that the scope of intervention is commensurate with the scope of the problem. It bears noting that the OECD,⁴ the FCC (on multiple occasions over the past two and one half years),⁵ the Justice Department,⁶ the FTC,⁷ and leading Internet gurus David Farber and Bob Kahn⁸ have concluded that the factual record did not justify the type of regulatory intervention that network neutrality proponents seek. The FCC's current Notice of Inquiry was hailed as an opportunity for network neutrality proponents to demonstrate the types of harms wrought by the absence of mandated network neutrality.⁹ The proceeding only turned up a few isolated instances that do not appear to support broadscale regulatory intervention.¹⁰

On the other hand, the Internet has a long history of adjusting to these types of problems by itself. Indeed, many examples to which network neutrality proponents point, such as network providers' initial resistance to virtual private networks (VPNs) and home networking equipment such as WiFi routers, are better regarded examples of how the private decisions of consumers

⁴ OECD Report, Internet Traffic Prioritisation: An Overview 5 (Apr. 6, 2007), *available at* <http://www.oecd.org/dataoecd/43/63/38405781.pdf>.

⁵ AT&T Inc and BellSouth Corp Application for Transfer of Control, Memorandum Opinion and Order, 22 FCC Rcd 5662, 5724-27 ¶¶ 116-20 & n 339, 5738-39 ¶¶ 151-53 (2007); Applications for Consent to the Assignment and/or Transfer of Control of Licenses, Adelphia Communications Corporation, Assignors, to Time Warner Cable Inc, Assignees, et al, Memorandum Opinion and Order, 21 FCC Rcd 8203, 8296-99 ¶¶ 217-23 (2006); Verizon Communications, Inc and MCI, Inc Applications for Approval of Transfer of Control, Memorandum Opinion and Order, 20 FCC Rcd 18433, 18507-09 ¶¶ 139-43 (2005); SBC Communications, Inc and AT&T Corp Applications for Approval of Transfer of Control, Memorandum Opinion and Order, 20 FCC Rcd 18290, 18366-68 ¶¶ 140-44 (2005); Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd 14853, 14904 ¶ 96 (2005).

⁶ Ex parte Filing of the Department of Justice, Broadband Industry Practices Before the FCC, WC Docket No. 07-52 (filed Sept. 6, 2007), *available at* <http://www.usdoj.gov/atr/public/comments/225767.pdf>.

⁷ Federal Trade Commission, Staff Report on Broadband Connectivity Competition Policy 10, 11 (June 2007), *available at* <http://www.ftc.gov/reports/broadband/v070000report.pdf>.

⁸ David Farber & Michael Katz, *Hold Off on Net Neutrality*, WASHINGTON POST, January 19, 2007, at A19; Andrew Orlowski, *Father of Internet Warns Against Net Neutrality*, THE REGISTER, Jan. 18, 2007, *available at* http://www.theregister.co.uk/2007/01/18/kahn_net_neutrality_warning/ (quoting co-developer of TCP/IP Robert Kahn).

⁹ Broadband Industry Practices, Notice of Inquiry, 22 FCC Rcd 7894 (2007).

¹⁰ See Kara Rowland, *FCC Set for Airwaves Auction*, WASH. TIMES, Jan. 16, 2008, at C8 (quoting FCC Chairman Kevin Martin as calling network neutrality regulation unnecessary).

and network providers can solve such problems without regulatory intervention. Comcast's recent accommodation of BitTorrent and Pando and Verizon's recent commitment to open networks represent more recent examples of the same phenomenon.

The better solution is to pursue what I have called "network diversity," in which different providers are permitted to experiment with different approaches and to let the choices of consumers control the ultimate outcome.¹¹ A case-by-case, after-the-fact approach would appear to strike a better would balance that preserves room for experimentation while simultaneously ensuring that any problems that may emerge will be addressed. The FCC's enforcement action against Madison River¹² and Chairman Kevin Martin's recent testimony before the Senate Commerce Committee¹³ attest to the agency's readiness to play this role.

¹¹ Yoo, *Beyond Network Neutrality*, *supra* note 2; *Network Neutrality and the Economics of Congestion*, *supra* note 2; Christopher S. Yoo, *Would Mandating Broadband Network Neutrality Help or Hurt Competition? A Comment on the End-to-End Debate*, 3 J. ON TELECOMM. & HIGH TECH. L. 23 (2004), available at <http://ssrn.com/abstract=495502>.

¹² Madison River Commc'ns, LLC, Order, 20 FCC Rcd 4295 (2005).

¹³ Written Statement of Kevin Martin, Chairman, Federal Communications Commission, Before the United States Senate Committee on Commerce, Science and Transportation 4-5 (Apr. 22, 2008), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-281690A1.pdf.